

What is claimed is:

- 1 1. A method for reducing copper corrosion in a semiconductor device
2 comprising:
 - 3 providing a semiconductor substrate with a Cu-containing conductive material
 - 4 formed thereon and a film directly interposed between said Cu-containing conductive
 - 5 material and the environment; and
 - 6 cleaning said semiconductor substrate using a DI water clean operation that
 - 7 includes rotating said semiconductor substrate at a spin speed no greater than 350 rpm.
 - 8
- 1 2. The method as in claim 1, wherein said providing includes performing an
2 etch operation that exposes said film and includes using a patterned photoresist layer
3 as an etch mask, and said cleaning said semiconductor substrate further comprises
4 removing portions of said photoresist layer.
- 1 3. The method as in claim 2, wherein said cleaning said semiconductor
2 substrate further comprises stripping said photoresist layer using a plasma prior to said
3 using a DI water clean operation.
- 1 4. The method as in claim 1, wherein said film comprises an etch stop film
2 and said providing comprises performing an etch operation that exposes said etch stop
3 film.
- 1 5. The method as in claim 4, wherein said performing an etch operation
2 comprises etching a dielectric layer formed over said etch stop film.
- 1 6. The method as in claim 5, wherein said etch stop film is disposed directly
2 beneath said dielectric layer.

1 7. The method as in claim 5, wherein said etching a dielectric layer is part of
2 a dual damascene dry etching process sequence.

1 8. The method as in claim 5, wherein said dielectric layer includes at least
2 one of a layer of carbon-containing material, a layer of nitrogen-containing material and
3 a layer of fluorine-containing material.

1 9. The method as in claim 1, wherein said Cu-containing conductive material
2 comprises substantially pure copper.

1 10. The method as in claim 1, wherein said film comprises one of SiN, SiC,
2 SiOC, and SiCN.

1 11. The method as in claim 1, wherein said film includes a thickness ranging
2 from 400 to 800 angstroms.

1 12. The method as in claim 1, wherein said cleaning includes rotating said
2 semiconductor substrate at a spin speed of at least 150 rpm during said DI water clean
3 operation.

1 13. The method as in claim 1, wherein said semiconductor substrate is
2 approximately 300mm in diameter and said spin speed lies within the range of 180 to
3 250 rpm.

1 14. The method as in claim 1, wherein said semiconductor substrate is
2 approximately 200 mm in diameter and said spin speed lies within the range of 200 to
3 300 rpm.

1 15. The method as in claim 1, wherein said cleaning further includes cleaning
2 said semiconductor substrate using an in-situ organic cleaning operation, an aqueous

3 chemical cleaning operation or a DI water/ozone cleaning operation, prior to said using
4 a DI water clean operation.

1 16. The method as in claim 15, wherein said in-situ organic cleaning
2 operation, aqueous chemical cleaning operation or DI water/ozone cleaning operation
3 comprises an organic cleaning operation using an organic solvent that contains fluorine.

1 17. The method as in claim 1, further comprising performing an in-situ drying
2 operation by spin drying said semiconductor substrate.

1 18. The method as in claim 17, wherein said spin drying includes air or
2 nitrogen as a gaseous medium.

1 19. The method as in claim 1, wherein said DI water clean operation includes
2 nitrogen or air as an ambient medium.

1 20. The method as in claim 1, wherein said cleaning comprises individually
2 cleaning said semiconductor substrate in a tool that processes semiconductor
3 substrates individually.